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INPUT-OUTPUT CONVERSION APPARATUS

Ernie G. Nassimbene, San Jose, Calif., assignor to International Business Machines Corporation, New York, N.Y., a corporation of New York

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This invention relates generally to a conversion apparatus and, more particularly, to conversion apparatus including a plurality of selectively energizable stages.

In many applications there exists a need for an economical two-way conversion apparatus. One example is an input-output device allowing two-way communication between an individual and a computer or other digital device. Previous devices for accomplishing such two-way conversion, such as complex modifications and additions to teletype or typing systems, have been too costly to justify widespread usage. Further, most prior devices required two completely separate systems, one allowing an individual to communicate with a computer, such as a keyboard and conversion system, and the other allowing a computer to communicate to the individuals, such as a display apparatus and conversion system.

Thus, it is an object of the present invention to provide a novel and economical two-way conversion apparatus.

Another object of the present invention is to provide a novel, economical device for two-way communication between an individual and digital apparatus.

Still another object of the present invention is to provide a combination keyboard and display apparatus utilizing a two-way conversion device.

In accordance with this aspect of my invention, a two-way conversion apparatus is provided having a pluralty of three-element gas tube stages, each stage being connected to a key of a keyboard so that actuation of the key ignites the gas tube stage, a common output connected to each of the stages, and a common input connected to each of the stages and so adapted that, upon receipt of a pulse on the common input, the stage immediately following the ignited stage is ignited and the previously ignited stage extinguished, thereby providing an output pulse on the common output line. Thus, the actuated key is indicated by the number of pulses required to sequence through the following stages until the final stage is ignited. The computer communicates by supplying a pulse to ignite the first stage and continuing the supply of pulses, sequentially stepping the conversion apparatus, until the desired stage has been ignited, the ignition of that stage providing a displace and understandable by an individual.

A further object of the present invention is to provide a touch-sensitive kayboard for communicating to a digital device, wherein actuation of a key causes a visual display indicative of the key which was actuated and wherein the digital device may itself operate the display to thereby communicate to the user.

In accordance with this latter aspect of my invention, touch-sensitive three-element neon gas tube stages are utilized as the gas tube stages, above, and means are provided to utilize the light given off by the ignited neon as a display.

A feature of the present invention is that the indication of the touch-sensitive key which has been actuated may be obtained by placing the corresponding neon tube directly under the key.

A further feature of the present invention is that interchangeable, transparent format sheets may be placed between the neon tubes and the transparent, touch-sensitive keys, thereby allowing alteration of the meaning of each of the keys.

The foregoing and other objects, features and advantages of the invention will be apparent from the following more particular description of a preferred embodiment of the invention, as illustrated in the accompanying drawings in which:

FIG. 1 is a perspective view of the exterior of a keyboard constructed in accordance with the present invention;

FIG. 2 is a functional block diagram of a column of a two-way converted constructed in accordance with the present invention;

FIG. 3 is a schematic diagram of the electronic components comprising the column of a converter of FIG. 2; and

FIG. 4 is a functional block diagram of a complete two-way converter constructed in accordance with the present invention.

Referring to FIG. 1, there is shown a keyboard unit **10** having a face plate **11** with a plurality of rows of touch-sensitive key areas **12** thereon. Each of the key areas is made of a transparent material, and room is provided in the keyboard for placement of a format sheet immediately underneath the keys. A slot **13** is provided for insertion and withdrawal of the format sheets. Thus, by changing format sheets, the meaning of each of the keys may be altered at will. Of course, it is necessary to coincidentally alter the program being followed by the associated computer.

Three touch-sensitive keys with permanent meanings are provided: "clear" key **14**, "accept" key **15** and "read" key **16**. Additionally, two permanent panel indicator light sources **17** and **18** are provided. Light source **18** is used to indicate that power is being supplied to the terminal, making it ready for used. Light source **17** is a neon lamp lighted, as will be explained hereinafter, by the computer to indicate that the computer is ready to transmit data to the terminal for the purpose of making a display.

Touching clear key **14** resets the entire keyboard so that any other keys previously actuated are turned off without transmitting data to the computer. Accept key **15** is touched to response to the lighting of lamp **17** to indicate that the operator of the terminal is ready to accept a display of data from the computer. Read key **16** is touched by the operator of the terminal to allow the computer to read data the operator has previously entered by touching various ones of the keys **12**.

In the preferred embodiment of the invention, each of the keys **12**, **14**, **15** and **16** utilizes a neon lamp which is located immediately below the transparent key. In this manner, touching one of the keys ignites the associated neon lamp, thereby iluminating the key to provide a display.

Thus, to enter information from the keyboard **10** to the associated computer, the operator touches selected keys **12**, visually verifies the message by noting the illumination of the touched keys, and then touches the read key **16** which sends a signal to the computer indicating that this terminal has a message. When the computer is ready to receive the information, it sends a pulse to the terminal for transmitting the message, as will be explained hereinafter.

To transmit information to the terminal **10**, the computer sends a pulse which turns on the "data coming" lamp **17**. When the operator is ready to receive the message, he touches the accept key **15** which sends a pulse back to the computer, and the computer responds by sending the message, lighting the appropriate keys **12**, thereby providing a display.

Referring to FIG. 2, there is shown a functional block diagram of the components comprising the converter for